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MISCELLANEOUS NOTES ON LAND MOLLUSCA

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Notes on the mating habits of *Limax gagates* Draparnaud, *Helicarion cuvieri* Ferussac, and *Cystopelta petterdi* Tate are included with a discussion of the habitat of *Cystopelta petterdi* and *Pasmaditta jungermanniiae* Petterd. These observations have been made in the vicinity of the west arm of the Tamar River, north Tasmania.

LIMAX GAGATES Draparnaud.

The introduced black slug is altogether too common throughout Tasmania. It is variable in size and colour so far as one has observed to the present. A pair of slugs was observed in the early morning, mating on the flat exposed surface of a piece of bark. The slugs, having approached within a few inches of each other, began circling so that each followed in the other's tracks. This circling was persisted with for some time, at least five minutes, until the mucous trail was of some thickness. At a moment when the slugs were at opposite points of the perimeter they both turned toward the centre and moved together whereupon mating took place. Some time later they were observed lying about an inch apart, but eventually the apparent condition of torpor was thrown off and both vanished from sight.

HELICARION CUVIERI Ferussac,

This species has been observed on numerous occasions in various stages of mating, as it is especially common on the Tamar. Almost invariably the larger individual pursues the smaller when there is difference in size in the individuals concerned. The course followed is very erratic, apparently having no rhyme or reason. The pursuer

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is frequently able to catch up, particularly if there is much difference in size, and on such occasions there is considerable interest manifest in the mucous gland of the pursued animal. The pursued then will increase speed to move away temporarily. After an indefinite period the erratic chase ceases and mating takes place. As to how long the process lasts one cannot say as there has always been insufficient time available to ascertain this point.

CYSTOPELTA PETTERDI Tate.

During a period of considerably increased rainfall, the native slugs became very plentiful in all sorts of situations. Two individuals were observed climbing a tree to a point approximately five feet from the ground. Without any preliminary courtship, at least to this point, mating took place. *Cystopelta petterdi* responds very noticeably to variation in rainfall. In periods of prolonged low rainfall it becomes very rare and difficult to find even in more or less marshy situations. With an increase in rainfall, however, numbers of individuals begin to appear within a relatively short period, and if the rainfall is persistent and prolonged over many months slugs may appear in places normally too dry for them. These adventurous ones are probably unable to find suitable places to enable survival as the warm weather approaches, and soil moisture lowers. In low rainfall areas the species cannot be said to be normally common or gregarious, and usually not more than one individual is seen at a time except when mating. However, during considerable increases in rainfall mentioned above, they become very common.

Cystopelta petterdi may be considered reasonably susceptible to dryness, due to its lack of a shell. Hence an attempt was made to ascertain how much "dryness" it could withstand in order to obtain a guide to its requirements for survival. *C. petterdi* does survive under a wide range of natural conditions, as it is found in wet forests, in tea-tree swamps, and in normal sclerophyll forests, and even when the rainfall is below 25 inches. The slugs observed were collected in dry sclerophyll forest growing on sandy soils a few miles from the mouth of the Tamar River. Individuals placed in a match-box where moisture, but not air, was excluded, shrivelled and dried after three to four hours in several cases, although one survived almost twenty-four hours. Several individuals placed in an airtight tin without moisture were found to have shrivelled and dried within three hours. Incidentally, individuals for these tests were obtained during a period of increased rainfall when they were frequent.

A number of individuals of *Helicorion curvieri* were collected for testing for comparative purposes. Those placed in a match-box remained alive for seven days after which they rapidly began to shrivel. But in an airtight tin they survived for less than three days. The greater survival ability of this species may be correlated with

the fact that in nature its activity continues under much drier conditions and over longer periods than any other native mollusc.

In the West Tamar area prior to 1953 a very much below average rainfall brought virtual drought conditions for many months at a time. *Cystopelta petterdi* survived these conditions, and, as noted above, responded readily to the subsequent increase in rainfall. During the summer months a careful search was made with a view to ascertaining conditions which would enable survival. It was found under rotting logs and bark in marshy areas, but this was not considered as a useful guide in dry areas where *Cystopelta* was very definitely absent from such places. It became obvious that only positions where the presence of moisture was possible were likely to yield results, and, furthermore, it would have to be a position where moisture could be relied on for several months at a time at least. There would have to be adequate shelter from the sun, and drainage conditions would have to be favourable.

Eventually a live individual was found in a position which met these requirements sufficiently to ensure survival at least during the summer months. This position was a shallow depression in which masses of leaves formed a mulch. There was a high proportion of shade present from trees and shrubs throughout the day, which, coupled with slope and the nature of the sub-surface drainage, would ensure moisture for a long period. The slug was found curled up on the moist soil beneath the leaves, and appeared to be in a torpid condition, suggesting a state of aestivation. Leaves on the surrounding surface outside the depression lay on dry soil. Although a search was made of numerous apparently favourable positions only few individuals were found despite the abundance of them a few months earlier.

Survival, then, seems to depend on the mollusc being in appropriate surroundings at the onset of dry weather, but how appropriate these surroundings were would depend on their efficiency as moisture traps, and in the long run the period during which rain was absent would tend to be the deciding factor. Many *Cystopelta* must die every year through lack of moisture in areas with a dry summer climate; however, under the normal climatic cycle, a breeding stock apparently survives through even prolonged dryness. The possibility that eggs may survive long periods of drought may be another factor but no information has been obtained in relation to *Cystopelta*. It is of interest to note that after prolonged dry periods, the first rains brought out literally thousands of juveniles of the introduced snail *Helicella caporta* Montagu, but fortunately a large proportion did not survive for long and a feared plague in the garden did not eventuate.

Shelled molluscs undoubtedly possess a decided advantage in being capable of retaining sufficient moisture within the shell for prolonged aestivation. *Helicarium curviers*, which cannot withdraw

into its shell entirely, is faced with a problem similar to that facing *Cystopelta*, though it is somewhat modified. *Helicarion*, as has been noted, is able to survive greater conditions of dryness than other native species. Is this only due to the presence of the shell? By comparison with other shelled molluscs this hardly seems likely, although it is not surprising that a shell, however inadequate, would be of some value. There is evidently some other factor involved.

PASMADITTA JUNGERMANNIAE Petterd.

A colony of this paraalomid species was found in a rotting log situated in a shaded position in dense bush, and a lengthy search in this area revealed only one other colony about a half a mile away. Inside the log these tiny molluscs were active at all times of the year, and with prolonged wet conditions some individuals were found moving about under leaves several feet from the log. In the Cataract Gorge at Launceston, thirty miles south of the above site, W. F. Petterd found this species in numbers crawling on moss-covered stones. Rainfall and rainfall reliability are somewhat higher at Launceston than at the mouth of the Tamar, and this may account for the greater exposure tolerated as suggested by this example. This species would seem normally to be gregarious and to live in apparently somewhat isolated colonies. Examination of a number of individuals suggests that the species is homogeneous. How did the colony under notice reach their particular log? A search of dozens of logs failed to reveal any more than those mentioned above.

It may be noted that only well-rotted logs are inhabited by molluscs. During prolonged wet weather some individuals do venture forth and these may perhaps furnish a link in the finding of a new home when the old one is eventually destroyed. Thus, one may imagine that these adventurers may find another suitable log in time and establish a new colony while the old one dies with its habitat, or falls victim to birds scratching in the final debris. The colony mentioned would appear to be a survival from days before the land in the area was cleared for purposes of cultivation, a matter of forty years. It is not necessarily implied that this present log housed them then, but it seems unlikely that there have been many available in the small area in which they were found. In addition, it seems unlikely that they may survive much longer as there is a dearth of logs in a suitable state of decomposition, but it may not be entirely out of the question as in this sheltered place there is always a quantity of debris in which molluscs may shelter, provided suitable food is available. Drought, fire, isolation, and the activities of man are becoming mighty forces in reducing the chances of survival of these tiny creatures in many places where once they were perhaps secure.